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# Implementing Client/Server Technology in an Academic Library: A Field-Based Study of Organizational Transition

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## Abstract

Despite the strong trend toward distributed computing systems, there has not been extensive research into the effects on organizations as they transition from centralized systems (e.g., mainframe). The proposed dissertation study will attempt to address this by chronicling the organizational change coincident with the implementation of a client/server computing system in an academic library. Two phases of research are planned. The first, exploratory phase, involves a longitudinal, field-based study of a single academic library at a mid-sized university. This paper outlines a plan for this initial phase of research. In the second phase, a comparative study of several academic libraries is planned, based on findings from the first phase. The author is currently in the early stages of data collection, so no findings are presented.

## Introduction

In recent years there has been a steady increase in the deployment of decentralized or distributed computing infrastructures in organizations. The rapid pace of innovation in network technologies has allowed client/server to emerge, for the present time, as the dominant model for enabling these distributed forms. Client/server's appeal derives from its ability to: "distribute" computer processing to less expensive hardware (e.g., desktop computers); facilitate scaleable systems; support graphical user interfaces (GUIs); and provide better fault tolerance and management of networks (Hall, 1994). Moreover, there is a growing awareness of the strategic importance of adopting Internet technologies -- e.g., World Wide Web (WWW) technology, intranets, etc. -- creating further interest in distributed computing technologies, including client/server.

Previous research has shown the development environment of distributed computing to be fast-paced, dynamic, and highly complex (e.g., *see* Sawyer & Southwick, 1996). The relatively immature state of client/server technology produces a tremendous challenge for developers as well as users of these systems. System vendors assume a more prevalent role in the client/server environment, with less software development taking place in-house (i.e., within the client organization by IS shops). However, vendors are faced with the problems of keeping their systems viable (state-of-the-art). The high level of demand for these products fuels intense competition among developers, and thus, constant innovation. Such innovation often occurs in a discontinuous, nonlinear manner, with new, revolutionary technologies typically *supplanting* old, rather than simply providing enhancements to their functionality. In addition, the "openly" distributed nature of the underlying architecture contributes to the dynamic nature of the development environment. Interoperability among technologies is required in a network that may be, literally, world-wide in scope. Therefore, client/server system vendors must, first, be able to produce products which perform at a level competitive with other vendors, and, second, they must be highly adaptable to the constantly changing requirements of clients. In such an environment it is more difficult for vendors to produce software products which remain stable over long periods of time, while simultaneously maintaining the productivity of, and the client commitment to, their systems.

For users of the distributed systems -- client organizations -- there is also difficulty.

- The development environment of client/server may be characterized as, potentially, *hyperturbulent*. The term, *hyperturbulent*, suggests that the demands of the distributed computing

environment may exceed the ability of the organization to adapt ((McCann & Selsky, 1984; Meyer, Goes, & Brooks, 1993). This situation applies to all organizations involved with developing and implementing these systems (vendors and clients), but appears especially challenging to the decision makers within the client organizations. Faced with a continual challenge to maintain technical expertise, decision makers are confronted with a high level of uncertainty in the process of information system development (ISD) -- i.e., which systems to adopt, when to change systems, etc.

- As stated above, there is an increased reliance on the systems' vendors. Given the highly changeable scenario of client/server technology, it is imperative for client organizations that the vendors be responsive to their changing needs, as they (the client organizations) are exposed to other technologies. That is, the vendors must be willing to adapt (update) existing products in a timely fashion in order to maximize performance enhancements enabled by new innovations, and/or to maintain interoperability with other software applications. Consequently, the client organization is left more vulnerable as "control" is delegated - via technical expertise - to the vendors.
- The delegation of technical expertise to vendors may affect the internal relations between the system user groups (the functional units within the organization) and the technologists within the organization -- e.g., Information Systems (IS), Network Support, etc. The transference of intellectual capital by the technologists (to the vendors) means that they must act as intermediaries or facilitators of the relations between vendor and user. This bears two implications: (1) change management skills may be emphasized over technical skills -- the technologists may be unwilling or unable to make this transition; (2) a conflict arises between the option of maintaining a more centralized control of computing resources and decentralizing control by integrating technologists within the functional units of the organization (i.e., the departments).
- New distributed technologies may affect the workflow within functional units of the organization. There is evidence that distributed computing forms, as with information technology (IT) in general, may "flatten" the hierarchical structures typical of traditional organizations by redistributing the control of, an access to, information (Zuboff, 1988). Evidence suggests, however, that social inertia and/or managerial authority may produce resistance to such change (Barley, 1986; Barley, 1990; Orlikowski, 1991). Regardless, this dynamic may introduce tension to relations within units of the organization.

## **Domain of Study**

Despite the strong trend toward distributed computing systems, there has not been extensive research into the effects on organizations as they transition from centralized systems (e.g., mainframe). The proposed study will attempt to address this by chronicling the organizational change coincident with the implementation of a client/server computing system in an academic library. Two phases of research are planned. The first, exploratory phase, involves a longitudinal, field-based study of a single academic library at a mid-sized university. This paper addresses this initial phase of research. In the second phase, a comparative study of several academic libraries is planned, based on findings from the first phase.

Several factors contributed to the selection of the client/server implementation at an academic library as a domain for study:

1. Academic libraries have been, and will continue to be, active adopters of distributed forms of computing. The Internet, and various Internet technologies such as the World Wide Web (WWW), enable access to remote databases. Such remote access is rapidly becoming a requisite to maintain strategic competitiveness rather than an optional service to be provided by an academic research library.

2. It is becoming increasingly important for academic libraries to adopt distributed technologies in order to integrate their computing infrastructure with other networks within the academic community (i.e., the college or university). This is the case with the academic library chosen for the initial phase of study. The university is undertaking a multi-year, campus-wide client/server implementation project. As all academic departments are involved, there is a broad-based commitment to, and involvement with, the transition across all segments of the academic community. This offers a rich context for study.
3. Although academic libraries are active adopters of distributed computing technology, there remain questions as to the nature of their agency in the deployment of computing resources. Historically, libraries have an uncertain stature relative to technical expertise, and thus, may have a constrained authority concerning decisions about deployment (Harris & Hannah, 1996). This sets the stage for a potential struggle for influence in the implementation and development of these distributed computing resources.

### **Approach to Research**

In line with more recent theory (Markus & Robey, 1988), the author assumes that information systems (IS) must be understood as a "product of social action" (Robey & Newman, 1996, p. 31.). This contrasts with earlier, technical imperative perspectives, in which social structures are assumed to be causally "determined" by the implementation of IT. Kling (1980) has made the broad distinction between theoretical perspectives on social action in the context of organizational computing: *systems-rationalist* and *segmented-institutionalist*. Whereas the systems-rationalist perspective "assume[s] that there is a marked consensus on major social goals relevant to computing use" (p. 63) by the organizational actors, the segmented-institutionalist perspective "assume[s] that intergroup conflict is as likely as cooperation unless the contrary is empirically demonstrated" (p. 65). Segmented-institutionalist researchers have tended to view social action as being driven by the (often non-rational) social relations between groups; especially as defined by power and political influence.

Distributed technologies, such as client/server, appear to "fit" well within the context of the segmented institutionalist perspective. The IT resources are dispersed, owned by the differentiated segments within contemporary organizational forms, and often extending beyond organizational boundaries, as exemplified in the use of Internet technologies. The inclusion of multiple stakeholder within, and outside, the organization expands the boundaries of the computing infrastructure "to include larger, more complex social worlds beyond the control of computer users" (Kling, 1980, p. 90). Thus, the concept of system, or computing infrastructure, may be seen as a complex and extensive *web* of people and social structures, as well as physical components (Kling & Scacchi, 1982).

Nevertheless, there remains no conclusive evidence of the superiority of one or the other of these perspectives (systems-rationalist versus segmented-institutionalist). Following Robey and Newman (1996), the researcher anticipates that these contrasting perspectives may provide broad analytic frameworks for "testing" the applicability of more specific theoretic perspectives (see Kling, 1980). By including contrasting analytic frameworks, it is hoped that the design will: (1) minimize theoretic bias by the researcher (Weick, 1984), and (2) provide basis for analytic comparison or generalization (Yin, 1989).

The researcher's theoretic framework influences the choice of methods. In order to gain an understanding of the complex social milieu which contributes to the socially inclusive definition of computing infrastructure, the researcher has selected a field-based, longitudinal study. Data collection will consist of formal and informal interviews, unobtrusive observation of worklife and organized events, and archiving of email, documents, etc. Through sustained inquiry over time, it is hoped that the researcher will be able to accurately document not only the objective events as they occur, but also to interpret the subjective views of the organizational actors as they ascribe meaning to this complex and uncertain phenomenon (Weick, 1984).

### **Research Questions**

***What are the sequences and patterns of action which take place in the implementation of the client/server technology?*** The empirical focus of the research is on the process of information system development. The researcher will define the process by identifying "events" which occur over time (Newman & Robey, 1992; Robey & Newman, 1996). Relationships between stakeholder groups provide a context for the social actions which define the events. A model of process will follow punctuated equilibria theory (Gersick, 1988; Gersick, 1989; Van de Ven, 1992). The assumption of a hyperturbulent development environment - i.e., nonlinear and discontinuous - guides this decision.

***How will decision makers within the library make decisions regarding the implementation and ongoing development of the client/server system?*** It is assumed that, because the technology is "cutting edge", there will be a high amount of uncertainty for decision makers. Will decisions be arrived at through "rational" consensus, or as a result of nonrational factors such as power - i.e., as defined by organizational relations producing *dissensus* as well as consensus (Miller, Hickson, & Wilson, 1996).

***How will relationships be altered among stakeholder groups participating in the implementation of the client/server technology?*** Three stakeholder groups are cited: (1) staff and managers within the library; (2) technologists outside of the library, but within the larger academic institution: i.e., Information Systems (IS), Network Services, etc.; and, (3) system vendor(s).

***Will the client/server technology affect changes in the organizational structures of the library, or will the organizational structures shape the technology?*** Or, will it be more of a process of mutual adaptation (Leonard-Barton, 1988). Structural changes include: reorganization of functional units and their respective tasks, and changes in social structure (rules, norms, goals, etc.). Implicit in this question is the assumption that client/server technology may represent a fundamentally different type of information technology (versus mainframe technology).

References: Available upon request from the author.